Health Consultation

Public Health Evaluation for the Intended Use of Paulson® Gaming Chips

April 1, 2008

Abstract

This health consultation provides an updated evaluation regarding potential health effects related to lead exposure from a particular formulation of gaming chip formerly manufactured and distributed by Gaming Partners International USA, Inc. (GPI USA).

The ADHS reviewed and analyzed several data sources to determine whether Paulson gaming chips pose a potential public health threat due to lead exposure. Data sources and analyses included: 1) An analysis of gaming chips purchased by ADHS from the internet and analyzed by the ADHS Public Health Laboratory; 2) An analysis of the Department's childhood and adult lead poisoning surveillance registries; and 3) An analysis of independently conducted studies that evaluate the use of gaming chips under simulated conditions in a laboratory and a casino.

Based on the available information, the ADHS concludes that there appears to be no lead-associated public health hazard from handling Paulson gaming chips when they are used by adult casino patrons and employees as intended in a casino. As a matter of general hygiene, ADHS recommends that casino players and dealers wash their hands after playing with gaming chips.

1.0 Introduction

In October 2007, ADHS was contacted by a local Phoenix television station and asked to comment on their investigative story about the high lead content in the Paulson ® brand gaming chips produced by GPI USA. The story was intended to air in the near future and did air on November 7, 2007. The television report, in which an ADHS employee participated, stated that Paulson ® brand gaming chips contained levels of lead ranging from approximately 2,000 parts per million (ppm) to more than 400,000 ppm.

Shortly thereafter, ADHS conducted independent testing on Paulson chips purchased from the internet and analyzed the chips at the ADHS Public Health Laboratory. The laboratory results found concentrations of lead that were lower than the results reported by the television station, but still higher concentrations of lead when compared with many other types of commercial products not known to be made from lead or lead compounds.

Because the Department was concerned about the potential hazard that the lead in gaming chips might pose to the patrons and staff when used as intended, and inadvertently to children when they are provided this adult gaming product purchased from the internet or brought home from casinos as a souvenir, the ADHS issued a health alert until further data became available. This report examines data that has become available since the November 2007 events which have enabled ADHS to determine that the Paulson brand gaming chips pose no public health threat to intended users.

2.0 Background

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing. Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High level exposure in men can damage the organs responsible for sperm production.

3.0 Methods

The ADHS has reviewed and analyzed several data sources to determine whether Paulson gaming chips pose a potential public health threat due to lead exposure. Data sources and analyses include:

- An analysis of gaming chips purchased by ADHS from the internet and analyzed by the ADHS Public Health Laboratory;
- An analysis of the Department's childhood and adult lead poisoning surveillance registries; and
- An analysis of independently conducted studies that evaluate the use of gaming chips under simulated conditions in a laboratory and a casino.

4.0 Results

4.1 ADHS State Public Health Laboratory Testing Results

ADHS Office of Environmental Health (OEH) staff purchased fourteen Paulson brand gaming chips from a gaming products website in November, 2007. ADHS does not know the date of manufacture of the gaming chips it purchased on the internet. GPI USA reportedly does not sell Paulson chips on the internet and does not market its products for use by children. GPI USA has also advised ADHS that lead content of Paulson chips was reduced significantly after 1998. The ADHS randomly selected seven of the fourteen chips and submitted them for testing at the ADHS Public Health Laboratory. EPA Method --- was used to prepare the chips and EPA method 6010B was used for lead

analysis. The ADHS laboratory detected lead in the chips at concentrations ranging from 2,200 to 26,000 parts per million (ppm) as shown in Table 1.

Table 1. ADHS Public Health Laboratory Results for Paulson ® Gaming Chips

Sample ID	Analyte	Results (ppm)	Method Reference
$1 – White	Lead	3,100	EPA 6010B
$5 – Red	Lead	14,000	EPA 6010B
$10 – Blue	Lead	2,600	EPA 6010B
$25 – Green	Lead	26,000	EPA 6010B
$100 – Black	Lead	2,200	EPA 6010B
$500 – Purple	Lead	2,900	EPA 6010B
$1000 – Orange	Lead	6,700	EPA 6010B

The ADHS laboratory results were substantially lower that concentrations of lead that were reported by the television station, but still high when compared to other commercially available products that were not known to be made from lead containing materials.

4.2 ADHS Lead Poisoning Prevention Program Surveillance Database

Background
The ADHS Lead Poisoning Prevention Program maintains the State registry for lead poisoning and conduct statewide surveillance. Lead poisoning is a disease that is reportable by physicians and laboratories to the ADHS Office of Environmental Health. Reporting requirements are based on the following statutes and rules: *A.R.S. 36-1672, A.R.S. 36-1673, A.R.S. 36-1674, A.R.S. 36-1675; A.A.C. R9-4-301 through R9-4-302.*

Clinical laboratories are required by state statute to report all blood lead test results to the ADHS. Physicians must report all elevated blood lead levels that are 10 micrograms per deciliter (µg/dL) or higher in children and 25 µg/dL or higher in adults. All reports must include specific information on patient demographics, the laboratory that ran the test, and the ordering physicians. Substantially elevated blood lead levels, specifically greater than or equal to 45 µg/dL in children and greater than or equal to 60 µg/dL in adults, must be reported by physicians and laboratories within 1 working day. All other elevated blood lead levels must be reported within 5 working days. Laboratories must report all non-elevated results (less than 10 µg/dL in children and less than 25 µg/dL in adults) at least once every month.

Surveillance Data Review
The ADHS reviewed the data from the Department's Childhood and Adult Blood Lead Registries and environmental investigations for 2006 and 2007 to determine whether the registry has identified any cases of lead poisoning that may have been attributable to exposure to lead in gaming chips. In all, the Department staff analyzed approximately

500 cases of childhood lead poisoning and approximately 100 cases of lead poisoning in adults.

The Department's analysis did not identify any cases of lead poisoning in which gaming chips or employment in gaming facilities were identified as a potential source of lead. Although no lead poisoning cases associated with gaming chips were identified, until now, the surveillance system did not specifically seek information regarding associations with gaming chips or gaming activities in casinos since the ADHS had not previously been aware that some gaming chips could contain lead.

4.3 Review of Independent Risk Assessment Simulation Studies

GPI USA responded to the concerns about the lead level in Paulson gaming chips that arose from the November 2007 television news story by commissioning studies by Exponent, Inc. to conduct research on exposure pathways to lead from Paulson gaming chips. The Department reviewed two documents written by Exponent, Inc. entitled: *Evaluation of Potential Exposure to Gaming Chips* (Exponent 2008 a); and, *Additional Evaluation of Potential Exposure to Gaming Chips*, Exponent (2008 b). These studies evaluate lead exposure to dealers and players (volunteers) during Blackjack games under a laboratory environment or actual casino conditions and examine whether the exposures pose a health threat.

The study in the laboratory used sample Paulson gaming chips with former formulations that contained lead at concentrations ranging from 10,000 ppm to 400,000 ppm. The study in the casino used Paulson chips from a regular casino bank. Results from fingertip wipe samples were varied based on the simulated conditions (i.e. color of chips used, touching or no-touching clothes and drinks) and individual behavior (i.e. handling chips aggressively, touching or no-touching clothes and drinks).

Fingertip wipes samples were collected to evaluate the potential for transfer of lead from the gaming chips to fingertips while handling gaming chips. Lead contents of the wipe samples were extracted by using a modified EPA Method 3050 and concentrations were determined by using EPA Method 6020 using ICP-mass spectroscopy by a California accredited laboratory. Area air samples collected from the breathing zones of dealers and players throughout the duration of the studies were used to evaluate potential inhalation exposure. These samples were analyzed by graphite furnace by an AIHA-accredited laboratory. Lead contents in chips were also analyzed.

Measured air concentrations in the breathing zones ranged from less than 0.03 to 0.05 $\mu g/m^3$. The air background concentrations ranged from less than 0.03 to 0.09 $\mu g/m^3$. The results of air testing showed that there was no measurable difference between lead in air at the gaming table and ambient air.

The results of the Exponent, Inc. analyses found that fingertip lead concentrations ranged from 0.2 to 14.5 µg/fingertip (micrograms per fingertip) after simulated play under the laboratory environment. Fingertip lead concentrations ranged from 1.1 to 13.9 µg/fingertip under actual casino conditions.

Exponent used a relatively conservative approach that would tend to over-estimate potential lead exposure to staff and patrons in casinos from the Paulson gaming chips. The reports estimated the number of fingertip contacts with the mouth that would be required to exceeded (US Occupational Safety & Health Administration) occupational criteria for lead in blood (30 μg/dL for adults and 10 μg/dL for women of child-bearing age), assuming that 100% of the lead on the fingertip is ingested, and the lead on the fingertip is "reloaded" by additional chip contact prior to the next mouth contact. The reports suggest that neither an adult dealer nor player, including child-bearing age women, is likely to significantly raise his/her blood lead level when gaming chips are used as intended by adults in a casino.

These simulation studies shed light on the risk from lead exposure from Paulson gaming chips when used as intended, although study limitations include sample size and behavioral variability in a population. These studies do not provide insight to potential exposures which may occur if an adult gives a gaming chip to a child.

5.0 Discussion

Prior to 1998, lead containing materials were commonly used in several colors of Paulson gaming chips. Beginning in 1998, Paulson gaming chips were reformulated to contain less lead, and the lead content in 72 of 78 types of Paulson gaming chips was reduced to 5,000 ppm or less. In 2006, the lead content in the remaining 6 types of chips was reduced to 5,000 ppm or less. Beginning in 2007, the lead content in all 78 colors of Paulson gaming chips was further reduced to 50 ppm or less (Exponent Personal Communication, 2008). By comparison, the current US Consumer Product Safety Commission standard for lead content in paint is 600 ppm. Paulson chips are not painted.

The concentration of lead in currently manufactured Paulson gaming chips has been reduced to 50 ppm, which is significantly lower than the U.S. Consumer Product Safety Commission standard for paint. This suggests that Paulson chips manufactured after the lead level was reduced in 2007 will continue to pose no potential public health hazard to patrons or staff of gaming facilities nor to children that may inadvertently play with these chips.

Because the current formulation contains lower levels of lead than the CPSC paint standard, the public health question then becomes: Do the Paulson chips that were manufactured prior to 2007, and especially, prior to 1998, pose a public health threat to patrons or staff of gaming facilities, or children that may inadvertently play with the chips?

The Department's review of the Arizona childhood and adult lead poisoning registries did not identify any cases of lead poisoning in which gaming chips or employment in gaming facilities were identified as a potential source of lead. Our review of the Exponent reports that examine lead exposure to dealers and players during Blackjack games supports the conclusion that neither adult dealers nor players, including child-bearing age women, are likely to significantly raise his/her blood lead level when gaming chips are

used by adults as intended in a casino. ADHS also offered to Arizona casinos free blood lead testing of any casino employee concerned of possible exposure to lead from Paulson chips. To date, no one has requested blood lead testing.

Routine handwashing has long been known as an effective public health intervention to prevent lead or other exposure from residue present on hands. While the results of this report suggest that adult dealers and players are unlikely to significantly raise his/her blood lead level when gaming chips are used by adults as intended in a casino, routine handwashing should be encouraged in order to minimize any exposure that might occur as a result of exposure due to play with Paulson gaming chips manufactured prior to 2007.

6.0 Conclusions

- Based on the available information, the ADHS concludes that there appears to be no lead-associated public health hazard from handling Paulson gaming chips when they are used by adult casino patrons and employees as intended in a casino.

- Based on the available information, the ADHS concludes that there appears to be no lead-associated public health hazard from any handling of Paulson gaming chips manufactured after 2007.

- As a matter of general hygiene, ADHS recommends that casino players and dealers wash their hands after playing with gaming chips.

References

Exponent (2008 a). Evaluation of potential exposure to gaming chips.
Exponent (2008 b). Additional evaluation of potential exposure to gaming chips.
Exponent, Personal Communication (3/21/08.) Patrick Sheehan, Principal- Exponent, Inc. 500 12th Street, Suite 220 Oakland, CA 94607